

Thawatchai Chanthong 2013: Studies on Structural, Magnetic, Thermal and GMR Properties of Co/Cu Multilayer Film for Sensing Application. Master of Science (Physics), Major Field: Physics, Department of Physics. Thesis Advisor: Miss Watcharee Rattanasakulthong, Ph.D. 111 pages.

In this study, structural, thermal, magnetic and GMR properties of the magnetic Ni, Co, Co/Cu/Co films and the multilayered-Co/Cu films on glass substrate prepared by RF-sputtering in Argon atmosphere were investigated. Ni films with different sputtering times (30, 60, 90, 120 and 150 min) show Ni (FCC) phase in (111) direction. A Ni film deposited for 90 min exhibits the highest perpendicular magnetic anisotropy. The Co films deposited for 25, 35, 45 and 55 min consist of Co (HCP) phase in (002) plane and show the ferromagnetic phase at room temperature. Surface roughness of Co films is increased with sputtering time increasing. For the Co films deposited longer than 35 min, saturation magnetization is increased whereas the film resistance is decreased because of the expansion of the magnetic granules perpendicular to the film surface. Co/Cu/Co films with various Co-layer sputtering times of 30, 60, 90, 120 and 150 min and Cu-layer deposited for 5 min display Co (HCP) in (220) direction and Cu (FCC) in (111) orientation and ferromagnetic phase at room temperature. The maximum GMR ratio of 0.15% at room temperature is found in Co/Cu/Co film sputtered for 120 min. Co/Cu multilayer films with different bilayers (Co layer: 45 and 90 min and Cu layer: 4 min) composed of Co (HCP) phase in (002) direction and Cu (FCC) in (111), (200) and (220) directions with the bilayers thickness of 272.38 and 296.25 nm, respectively. All films exhibit ferromagnetic phase at room temperature and  $H_c$ ,  $M_s$ ,  $H_s$ ,  $M_r$  and  $M_r/M_s$  value are slightly varied with a number of film layers. The 8-layers Co/Cu: 45/4 and 10-layers Co/Cu: 90/4 films show the maximum GMR ratio of 0.20% and 0.24%, respectively. The surface roughness of the maximum GMR films is about 0.8 nm.

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Student's signature

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Thesis Advisor's signature